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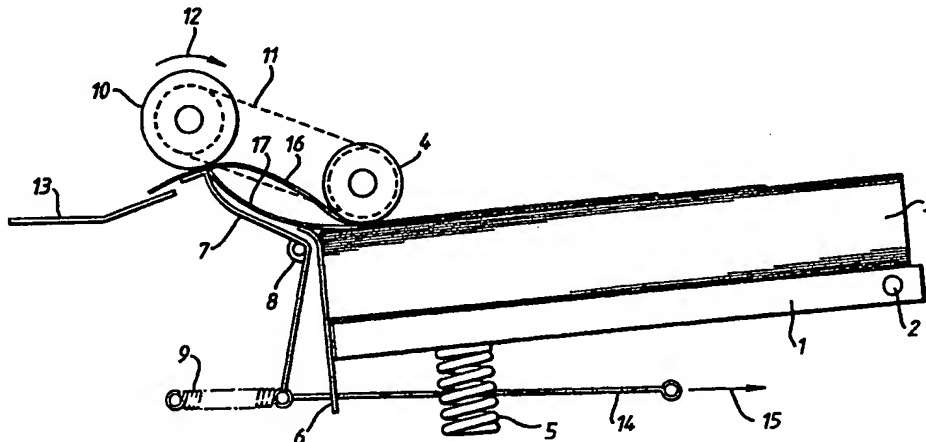
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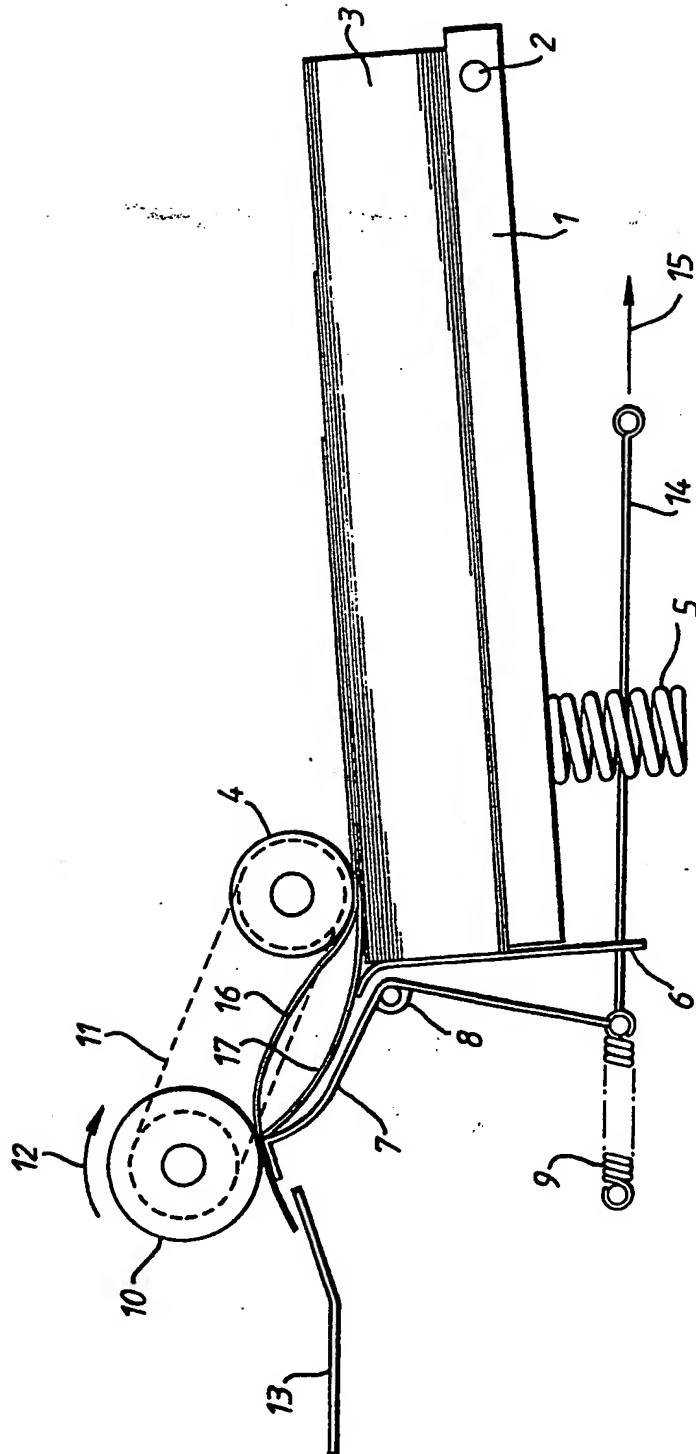
(58) Field of search

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(54) Sheet feed

(57) A system for feeding a sheet member from a stack (3) has a primary feed roller (4), a spring-urged, curved guide ramp (7), and a secondary feed roller (10) for selectively engaging the sheet and separating it from any further sheet member(s) fed with the first sheet member by said primary feed roller (4).





MULTI-GRADE SHEET FEED SYSTEM

This invention relates to a device or system for the individual feeding or separating of sheet members such as sheets of paper of different or varying
5 thicknesses.

The customary method of feeding sheets from a stack or cassette is by introducing a rigid form of obstruction into the path of the leading edge of the sheet being fed and supplying sufficient traction to
10 the surface of the sheet to force the sheet past the obstacle. These obstacles are usually positioned to impede the front corners of the sheet and a flick-out effect is created to the sheet being fed whilst the underneath sheets are restricted. It follows that this
15 method can only be used on sheets that are light enough to flick. This invention is intended to overcome the problem and be sufficiently versatile to handle a wide range of materials from lightweight papers to reasonably heavy card.

20 According to the present invention there is provided a sheet feeding system for feeding a sheet member from a stack comprising a plurality of such sheet members, said system comprising: a primary feed means adapted to contact an exposed surface of a first
25 sheet member in the stack and to feed that sheet; a guide means in the path of the first sheet member fed from the stack, said guide means including a curved surface for guiding said sheet member and initiating a separation; and, preferably, a secondary feed means for
30 selectively engaging said first sheet member and separating it from any further sheet member(s) fed with the first sheet member by said primary feed means.

A specific embodiment of this invention will now be described by way of example with reference to the
35 accompanying drawing the single Figure of which is a schematic side elevation of one version of the

invention.

Referring to the Figure, a tilting platform 1 is pivoted about a shaft 2 and supports a stack of paper sheets 3 which is held in contact with a primary drive roller 4 by the pressure of a spring 5. A bulkhead or weir plate 6 is suitably positioned for the abutment of the stack along its leading edge. This weir plate 6 is inclined on the upper face to provide an easy path for the movement of the sheets. A suitable ramp 7 is positioned to accept the sheets when fed and curve them into the path of a secondary drive roller 10. The secondary drive roller 10 is coupled to the primary drive roller 4 by a suitable drive arrangement, e.g. a drive belt 11, such that the peripheral speed of the roller 10 is faster, e.g. about 20% faster, than that of the roller 4 (as a result of the fact that the roller 10 has a larger radius than the roller 4). The direction of rotation is indicated by arrow 12. The ramp 7 is pivoted at point 8 and held in contact with the roller 10 by a spring 9. A link 14 is connected to the ramp 7. A suitable platform 13 is provided to support the sheets after separation.

The method of operation is as follows:

When the primary drive roller 4 is caused to rotate by a motivating force (not shown), one or more sheets are disturbed from the top of the stack 3 and caused to pass over the upper face of the weir plate 6, up the face of the curved ramp 7 and into the path of the secondary roller 10 which is revolving. The angle of approach is designed such that the sheet is momentarily stopped whilst the traction applied to the surface of the top sheet causes a buckle or bow 16 to form.

This sheet is then picked up by the secondary roller 10 and caused to pass over the top surface of the curved ramp 7. This action of buckling or bowing

the sheet has the effect of lifting the top sheet upwards and creating an air gap which reduces the friction between adjacent sheets. The ramp 7, being spring loaded by the spring 9, is allowed to move to
5 provide the necessary clearance for different grades of paper and also to compensate for the variations of the grades to the actions of bowing and bending. The reason for the difference in the peripheral speeds of the two rollers is to maintain a taut condition in the
10 top sheet so that a firm contact is preserved between the sheet being fed and the top surface of the ramp 7 to ensure that any entrained sheets 17 remain stationary until the top sheet has gone.

In the event of a malfunction, the link 14 can be
15 moved in the direction of arrow 15 which unloads the pressure between the ramp 7 and the secondary roller 10 thus allowing any entrained sheets 17 to be removed against the direction of flow. This release action can also be coupled to the spring 5 to drop the platform 1
20 for the complete release of traction throughout the system.

It is envisaged that this system could be inverted and used for feeding and separating sheets fed from the bottom of a stack.

25 It is also envisaged that the separation system could be incorporated in any paper feed path to deal with multi-feed malfunctions.

This system provides five separate and distinct phases of separation:-

30 (1) Due to the low pressure required under the roller 4 a minimal disturbance is caused to the underlying sheets.

(2) The curving of the sheet or sheets up the ramp 7 breaks the surface tension between sheets using
35 the natural effect of the difference in rolling radii.

(3) The momentary stop in the progress of the

sheets when coming into contact with the secondary the roller 10 causes the top sheet, which is under traction from roller 4, to buckle and curve away thus breaking the tension between the sheets and producing an air gap.

5 (4) The picking up of the top sheet by the roller 10 and curving it over the top surface of the ramp 7 creates a physical retarding influence to any underlying sheet that may be present.

10 (5) The difference in peripheral speeds between the rollers 4 and 10 maintains a taut condition in the top sheet keeping it in close contact with the top surface of the ramp 7 thus preventing the ingress of another sheet.

15 In the illustrated embodiment the spring 5 is shown in a simple form. In practice it can comprise devices such as levers, cams, counterbalances or other means to maintain a predetermined pressure the under roller 4 and compensate for the reducing weight of the stack of papers 3.

20 As can be seen from the above, one feature of the present invention is that there is used a concave ramp in the paper path into which the sheet or sheets fed from the primary drive roller are progressed. If only one sheet is present all is well. If more than one
25 sheet moves onto this ramp the natural reaction of rolling the sheets up the curve is to start a separation slip tendency, as a result of the difference in the rolling radius of the rollers. When dealing with thin papers this effect is, of course, quite
30 small. However when feeding heavier papers or card, the result of this one action is sufficient for separation. A second stage separation is provided by the action of driving the advancing papers into the path of the secondary roller suitably positioned at the
35 top of the curved ramp to cause the leading edge to be deflected over the top of the ramp and along a surface,

e.g. a lip, arranged at about 90 degrees to the curvature of the ramp. The net effect of this deflection is to cause the top sheet to pass over the top of the ramp whilst any other sheets that may have
5 been fed by surface attraction are driven into the curved face. This action causes an air gap to form and thereby breaks the surface tension. This air gap is maintained by the difference in speed between the primary and secondary rollers. As an added precaution,
10 the top surface of the ramp may be provided with a retard pad which is made of a material having a slightly lower coefficient of friction than the feed rollers.

The sheet feed system can form part of an office
15 machine such as a photocopier or printer.

CLAIMS

1. A sheet feeding system for feeding a sheet member from a stack comprising a plurality of such sheet members, said system comprising:

5 a primary feed means adapted to contact an exposed surface of a first sheet member in the stack and to feed that sheet;

a guide means in the path of the first sheet member fed from the stack, said guide means including a
10 curved surface for guiding said sheet member and initiating a separation; and, optionally,

a secondary feed means for selectively engaging said first sheet member and separating it from any further sheet member(s) fed with the first sheet member
15 by said primary feed means.

2. A system as claimed in claim 1, wherein the primary feed means comprises a roller.

3. A system as claimed in claim 1 or 2, comprising means for urging the stack of sheet members
20 against the primary feed means.

4. A system as claimed in any of claims 1 to 3, wherein the secondary feed means comprises a roller.

5. A system as claimed in claim 4 when appendant to claim 2 or 3, wherein the rollers have different
25 radii.

6. A system as claimed in any of claims 1 to 5, wherein the guide means comprises a ramp.

7. A system as claimed in claim 6, wherein the guide means comprises a concave ramp.

30 8. A system as claimed in any of claims 1 to 7, comprising means for urging the guide means towards the secondary feed means.

9. A system as claimed in claim 8 when appendant to any of claims 4 to 7, wherein the ramp is pivotally
35 mounted, and is spring loaded so as to be urged towards the roller acting as the secondary feed means.

10. A system as claimed in any of claims 1 to 9,
comprising an abutment member that in use abuts an edge
of the stack of sheet members so as to prevent feed of
the sheets, by the primary feed means, apart from the
5 uppermost or lowermost sheet member or members.

11. A system as claimed in any of claims 1 to 10,
comprising means for retarding the feed of said first
sheet member in the vicinity of the secondary feed
means.

10 12. A system as claimed in claim 1, substantially
as hereinbefore described with reference to, and as
shown in, the drawing.

13. An office machine including a sheet feeding
system as claimed in any of claims 1 to 12.

15 14. A machine as claimed in claim 13, the machine
being a photocopier or printer.